United States Patent [19]

Shirasawa

[11] **Patent Number: 4,802,380**

[45] **Date of Patent: Feb. 7, 1989**

[54] **HANDLE CONTROL FOR A SLOT MACHINE**

[75] Inventor: **Masaharu Shirasawa,** Tochigi, Japan

[73] Assignee: **Kabushiki Kaisha Universal,** Tochigi, Japan

[21] Appl. No.: **91,498**

[22] Filed: **Aug. 31, 1987**

[30] **Foreign Application Priority Data**

Aug. 29, 1986 [JP] Japan 61-203449

[51] **Int. Cl.**[4] **G05G 1/04;** F16D 41/04

[52] **U.S. Cl.** **74/523;** 192/48.92; 192/48.9

[58] **Field of Search** 74/519, 523, 524, 525, 74/528, 543, 545; 192/48.92, 48.6, 48.9

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,924,317	2/1960	Holstein	192/48.92
3,563,353	2/1971	Presti	192/48.92
3,664,207	5/1972	White	192/48.92
3,743,067	7/1973	Bokovoy	192/48.92
3,895,701	7/1975	Albertson et al.	192/48.92
3,941,008	3/1976	Cambria	74/143
4,128,152	12/1978	Tschursch	192/48.92
4,241,534	12/1980	Larson et al.	192/48.92
4,254,577	3/1981	Cheng	192/48.92
4,436,192	3/1984	Longrod	192/48.92
4,503,724	3/1985	Ward	192/48.92
4,567,786	2/1986	Sakurai	74/523

FOREIGN PATENT DOCUMENTS

520751	1/1956	Canada	192/48.92
794732	5/1958	United Kingdom	192/48.92
1232899	5/1971	United Kingdom	192/48.92

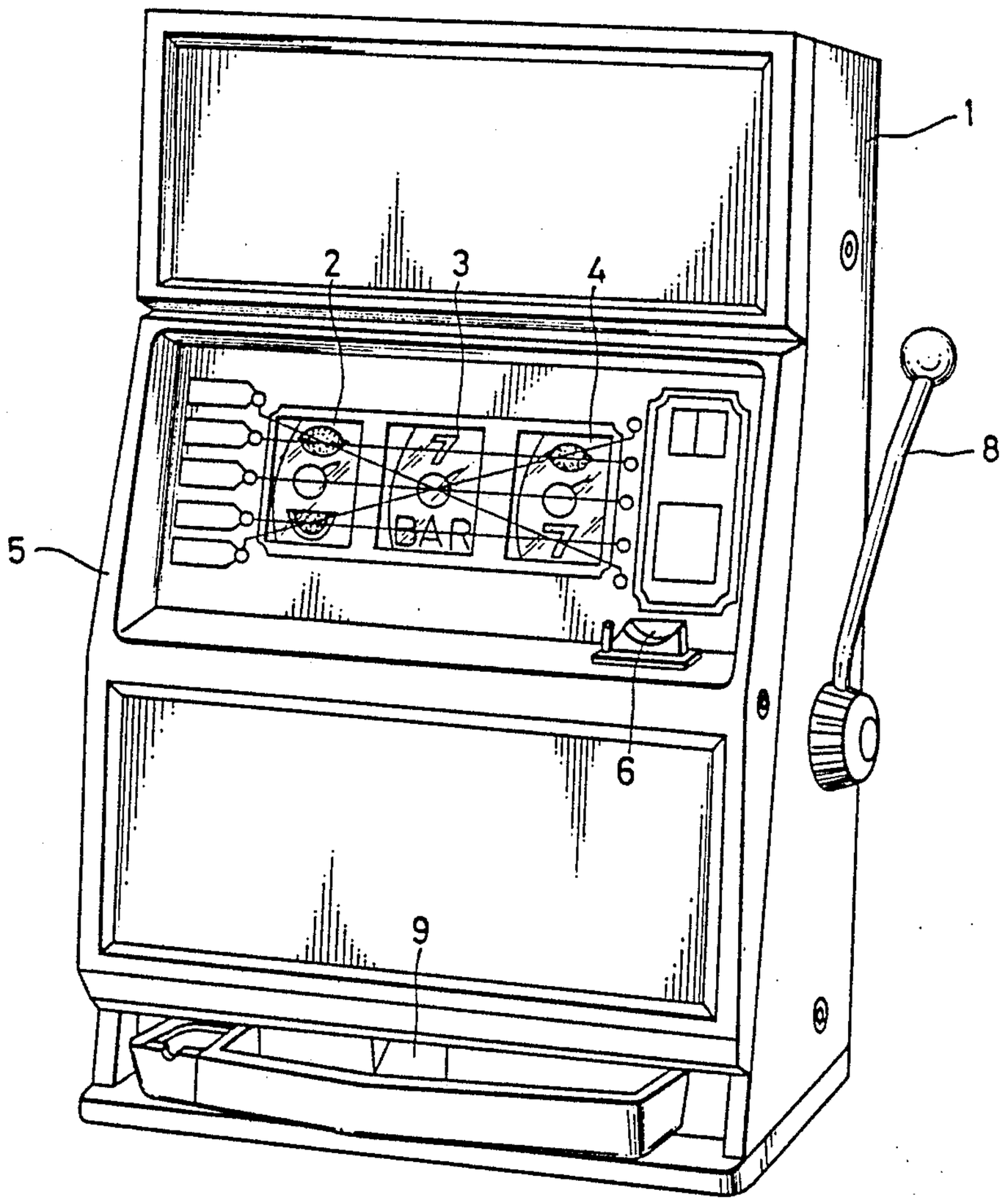
Primary Examiner—Richard E. Moore
Assistant Examiner—Vinh Luong
Attorney, Agent, or Firm—Young & Thompson

[57] **ABSTRACT**

A handle control device for a slot machine in which a handle is operated to start a game, includes a rotatable wheel supported on a fixed shaft for rotation with the handle. Unidirectionally but oppositely rotatable clutch wheels are mounted on the fixed shaft and disposed on opposite sides of the rotatable wheel. An interconnecting member is moved in one or another direction according to the positions of the handle so as selectively to interconnect the rotatable wheel to one or the other of the clutch wheels.

3 Claims, 4 Drawing Sheets

FIG. 1



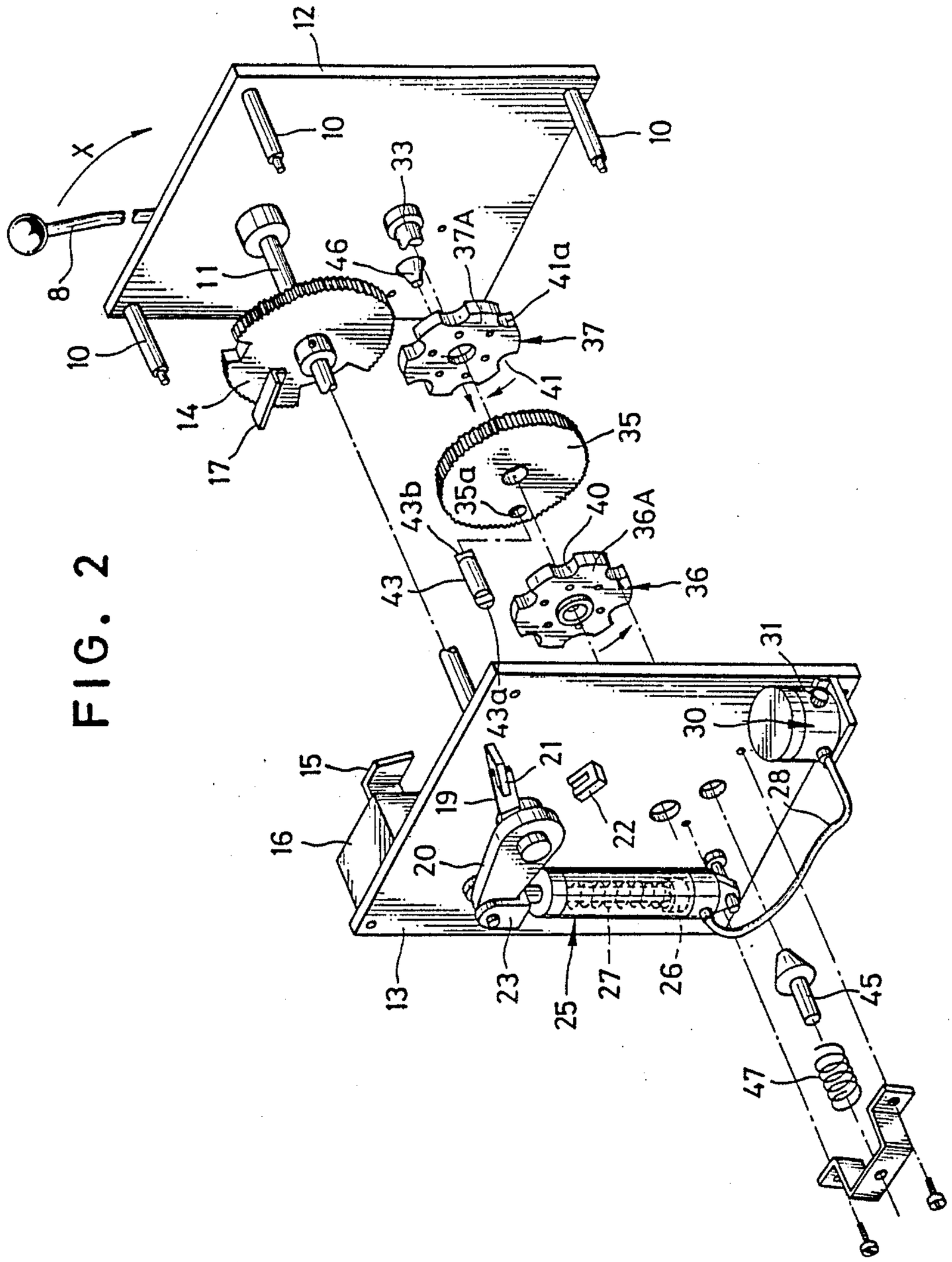

12
10
10
X
33
8
11
46
37A
41a
37
10
41
14
35
17
35a
43b
40
36A
43
36
31
43a
30
15
21
19
28
16
22
20
45
13
23
25
27
26
47

FIG. 2

FIG. 3

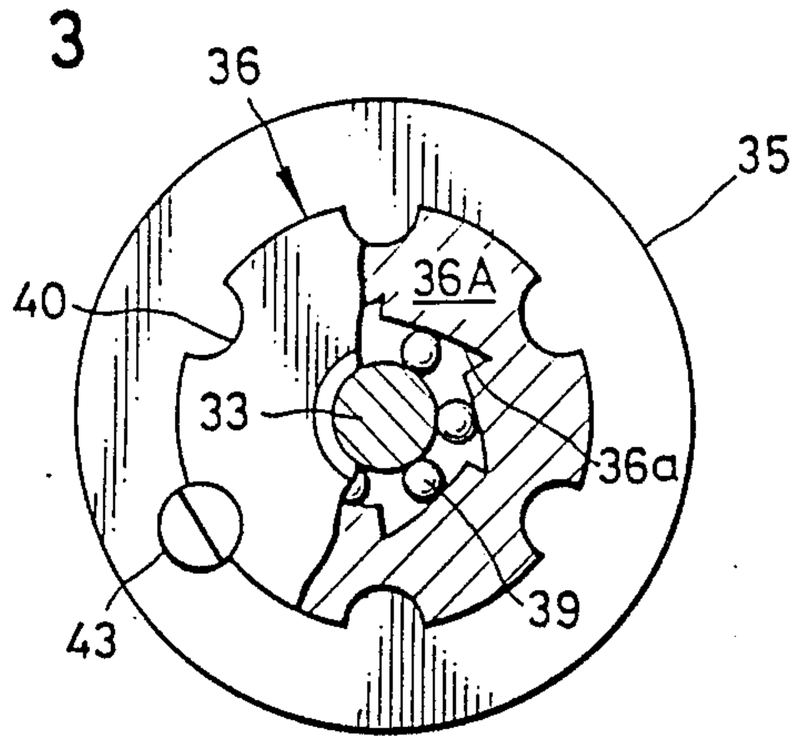

36
35
40
36A
33
36a
39
43

FIG. 4

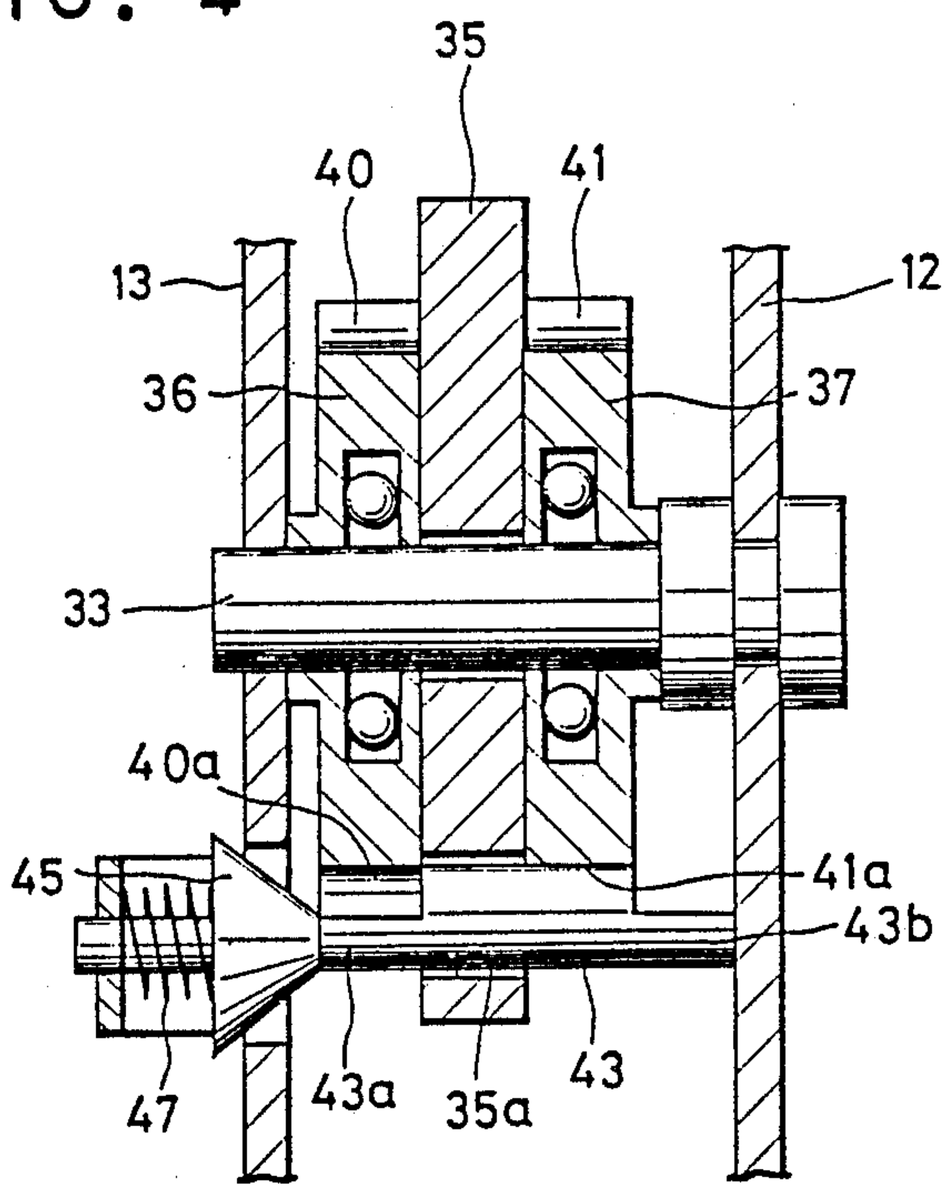
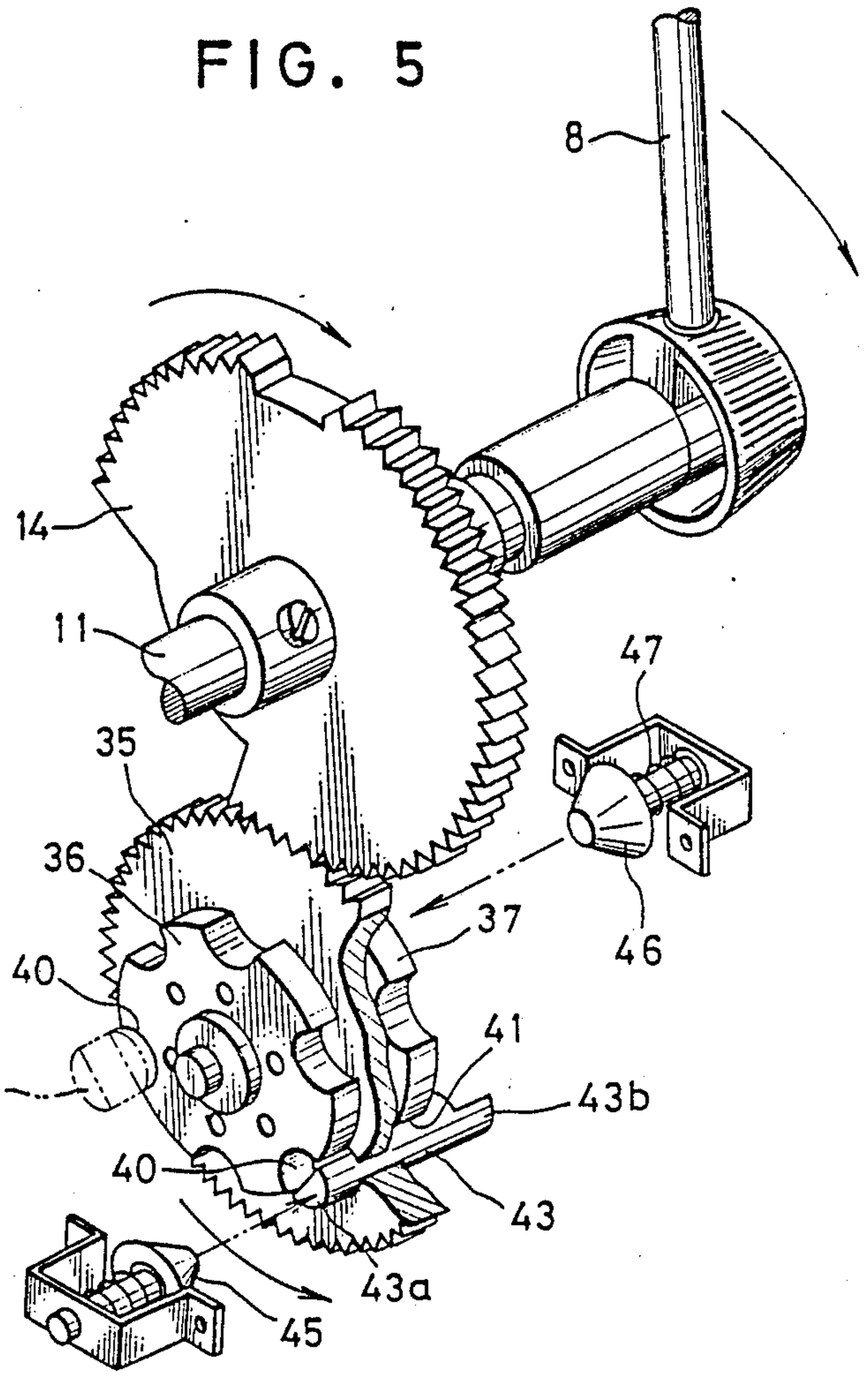

35
40
41
13
12
36
37
33
40a
45
41a
43b
47
43a
35a
43

FIG. 5



HANDLE CONTROL FOR A SLOT MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to an operating handle control device for controlling the operation of a handle of a slot machine.

Slot machines are generally provided with an operating handle control device for controlling the operation of a handle with its associated elements to start the reels of the slot machine. Such a device has a mechanism for restricting the operation of the operating handle in such a way as to prevent the operating handle, once operated, from restarting the machine upon its return to its initial position and/or to prevent the operating handle from being reoperated until the operating handle returns to the initial position.

For effecting this restriction of the operating handle, various actuating devices having restricting mechanisms are known in the art. One such operating handle control device, disclosed in, for example, Japanese utility model unexanined publication No. 59-22,188 and Japanese utility model publication No. 61-21,089, is provided with a restricting mechanism comprising a ratchet wheel provided integrally with, or cooperating with, the operating handle, and a ratchet engageable with the ratchet wheel.

Due to the provision of the ratchet and ratchet wheel, this operating handle control device not only has an increased number of parts but also is complicated in construction. Furthermore, the restricted mechanisms are liable to malfunction when the ratchet and ratchet wheel are engaged with and disengaged from each other, resulting in an improper operation.

Moreover, because the ratchet frequently engages with and disengages from the ratchet wheel, the ratchet and ratchet wheel are liable to wear and develop play.

OBJECTS OF THE INVENTION

It is, therefore, an object of the invention to provide an operating handle control device for an amusement machine which is simple in construction.

It is another object of the present invention to provide an operating handle control device for an amusement machine which is durable.

SUMMARY OF THE INVENTION

According to the present invention, the operating handle control device for a slot machine comprises a rotatable wheel cooperating with the operating handle and a pair of rotatable clutch wheels coaxially mounted on opposite sides of the rotatable wheel. The two clutch wheels are rotatable unidirectionally but oppositely to each other. An interconnecting means is provided between the rotatable wheel and the clutch wheels so as to selectively operationally interconnect the rotatable wheel and either one of the clutch wheels. Due to the provision of the unidirectionally but oppositely rotatable clutch wheels, the rotatable wheel is restricted to rotate according to the operated positions of the operating handle, thereby restricting the operating direction of the operating handle.

According to a feature of a preferred embodiment of the present invention, structure associated with the operating handle control device can be disposed around the shaft of the rotatable wheel. Due to such a disposition of the associated structure, the operating handle control device can be made not only compact in construction but also with a decreased number of parts in comparison with conventional slot machine operating handle control devices which comprise basically a ratchet and a ratchet wheel. Due to the decreased number of parts and the compact construction, the operating handle control device of the present invention is improved in reliability and durability.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a slot machine embodying the present invention;

FIG. **2** is an exploded perspective view of the operating handle control device of the present invention;

FIG. **3** is a partly cross sectional view of the essential parts of a one-way clutch incorporated in the actuating device of FIG. **2**;

FIG. **4** is a cross sectional view of the essential parts of the operating handle control device of FIG. **2**; and

FIG. **5** is a perspective illustration, with parts broken away, showing the operation of the essential parts of the operating handle control device of FIG. **1**.

DETAILED DESCRIPTION OF THE INVENTION

The following description is directed to a slot machine in which the present invention is embodied. The slot machine and its actuating device incorporate various elements. Because such elements are well known to those skilled in the art, this description will be directed in particular to elements forming part of, or cooperating directly with, the actuating device embodying the present invention. It is to be understood that the actuating device itself can be applicable to any of various amusement machines having an operating handle well known to those skilled in the art.

Referring now to the drawings in greater detail, wherein like reference numerals denote the same or similar elements or parts throughout the several views, FIG. **1** shows a slot machine embodying the present invention. The slot machine **1** has three reels **2** to **4** mounted individually rotatably on a shaft, each reel having an annular series of various symbols such as pictures of cherries, lemons or characters or numbers, or the like on the peripheral surface thereof at regular intervals. These reels **2** to **4** are caused to rotate simultaneously by manipulation of an operating handle **8** provided on a side of the slot machine **1** only after insertion of, for example, one to three coins or tokens through a coin slot **6**. Upon the respective reels **2** to **4** stopping during each game, symbols on the reels **2** to **4** in stopped position are visible through windows provided in a front surface of the slot machine.

Specifically, when coins are inserted into the slot machine through the coin slot **6**, a retaining mechanism which retains the operating handle **8** in an initial position shown in FIG. **1** is caused to release the operating handle **8**. Then the operating handle **8** is fully pulled to start motors for the respective reels **2** to **4** simultaneously so as to rotate the reels **2** to **4**; and a game is played. According to stop signals generated by a random timer, the reels **2** to **4** stop to display symbols in the windows. The slot machine detects the stopped positions of the respective reels **2** to **4**, thereby to determine whether a predetermined prize-winning combination of symbols has occurred on a specified winning line or lines, and if in fact there has occurred any prize-winning combination of symbols, to cause a payment of coins or

token in accordance with the type of combinations, into a coin saucer **9**.

Referring to FIG. **2** showing the operating handle control device of an embodiment according to the present invention, there is a base plate **12** which is fixed to the inside of the side wall of the housing of the slot machine **1**. Attached to the base plate **12** by four struts **10** is a side plate **13** on which various elements are mounted. A shaft **11** to which the operating handle **8** is fixed at its outer end is supported for rotation between the base and side plates **11** and **13**. Fixed to the shaft **11** is a driving gear **14** provided with a lug **17** engageable with a hook **15** of a retaining means **16** mounted on the side plate **13**. The retaining means **16** is actuated to operate when a coin or coins are inserted into the slot machine **1**. Therefore, if no coin has been inserted into the slot machine **1**, the hook **15** is maintained in engagement with the lug **17** so as to prevent the driving gear **14** from being rotated by the operating handle **8**. This means that the operating handle **8** is maintained in its original position shown in FIG. **2** until a coin is inserted into the slot machine **2**.

The shaft **11** has an inner end extending inside the side plate **13** and attached to a light-opaque member **19** and an arm **20**. A pair of photointerrupters **21** and **22** on the side plate **13** are disposed to be interrupted by the light-opaque member **19** when the shaft rotates. Specifically, the light-opaque member **19** interrupts the photointerrupter **21** when the operating handle **8** is in the initial position and the photointerrupter **22** when the operating handle is pulled in a direction shown by an arrow X in FIG. **2** to a predetermined angular position wherein the reels **2** to **4** are started to rotate.

To a free end of the arm **20**, a piston rod **26** of an air cylinder **25** is attached through a crank arm **23**. This piston rod **26** is urged downwardly by a coil spring **27** in the cylinder **25** so as to urge the shaft **11** to rotate in the counterclockwise direction, thereby returning the operating handle **8** to the initial position. A regulating unit **30** cooperates with the air cylinder **25** through a tube **28** to control air flow into and from the air cylinder **25**, thereby causing the piston rod **26** to retract slowly and smoothly. For adjusting the speed of movement of the piston rod **26**, there is a screw **31** which is turned to regulate a needle valve which is well known in the art and so is omitted from FIG. **2**.

The base plate **12** is provided with a fixed pivot **33** on which is mounted a driven gear **35** in mesh with the driving gear **14**. On opposite sides of the driven gear **35**, one-way clutches **36** and **37** are mounted for rotation on the pivot **33**. These one-way clutches **36** and **37** are rotatable only in directions opposite to each other.

As is shown in greater detail in FIG. **3**, the clutch **36** comprises an annular clutch wheel **36A** having a plurality of jaw grooves **36***a* formed in its inner surface and a plurality of clutch balls **39** disposed one between each jaw groove and the pivot **33**. Due to the jaw groove - clutch ball construction, the clutch wheel **36A** is allowed to rotate in the counterclockwise direction but is prevented from rotating in the clockwise direction as viewed in FIG. **3**. On the other hand, the one-way clutch **37** is constructed in the same way as the one-way clutch **36** but allows the clutch wheel **37A** to rotate only in the clockwise direction as viewed in FIG. **3**. It is to be understood that the one-way clutch itself may take any of various forms well known to those skilled in the art and already commercially available.

Each clutch wheel **36A**, **37A** is formed with a semicircular groove **40**, **41** every 60 degrees on the periphery thereof, namely six grooves in total in this embodiment. However, it is to be understood that the number of the semicircular grooves is not limited to six so long as it is at least three.

Referring to FIGS. **2** and **3**, the driven gear **35** is formed with a hole **35***a* in which a shift pin **43** is supported for sliding movement. Each end of the shift pin **43** has an extension **43***a*, **43***b* which has a semi-circular cross section with the same diameter as that of the semicircular groove **40**, **41** of each clutch wheel and a length at least the thickness of the clutch wheel **36A**, **37A** of each one-way clutch **36**, **37**.

On each plate **12**, **13**, there is a frustoconical spindle pin **45**, **46** urged by a coil spring **47**. These frustoconical spindle pins **45** and **46** are disposed at the same distance from the fixed pivot **33** but are shifted in angular position by a predetermined angle, for example 120 degrees in this embodiment. The frustoconical spindle pin **46** is so positioned as to bear against the end of the extension **43***b* of the shift pin **43** when the operating handle is in the initial position, forcing the extension **43***b* of the shift pin **43** out of the semi-circular groove **41** of the clutch wheel **37A** of the one-way clutch **37**, thereby to disconnect the operational coupling between the driven gear **35** and the clutch wheel **37**. Simultaneously, the opposite extension **43***a* of the shift pin **43** is brought into engagement in the semi-circular groove **40** of the clutch wheel **36A** of the one-way clutch **36** so as to operationally couple the clutch wheel **36** to the drive gear **35** through the shift pin **43**, as is clearly shown by a double-dotted line in FIG. **5**.

In the operation of the slot machine in which the present invention is embodied, when one or more coins are inserted into the slot machine **1** of which the operating handle **8** is in its initial position shown in FIGS. **1** and **2**, the retaining means **16** is actuated to release the hook **15** from the lug member **17** of the driving gear **14**. As a result, since the driving gear **14** is enabled to rotate, the operating handle **8** is made operable. When the operating handle **8** is pulled in the direction shown by the arrow X, the driven gear **35** is rotated in the counterclockwise direction through the driving gear **14**. Because the driven gear **35** is, by the shift pin **43**, coupled to the clutch wheel **36A** of the one-way clutch **36** on which can rotate only in the counterclockwise direction, the driven gear **35** and the one-way clutch **36** rotate in the counterclockwise direction as a unit while leaving the one-way clutch **37** disconnected from the driven gear **35**. When pulling the operating handle **8** in the direction shown in the arrow X, the driven gear **35** is prevented from clockwise rotation by means of the one-way clutch **36**, so as to prevent the operating handle **8** from being reversed. Due to the rotation of the shaft **11** which is caused by the driven gear **14**, the arm **20** is turned in the clockwise direction to pull up the piston rod **26** while compressing the coil spring **27**. As a result, air flows into the air cylinder **25** through the regulating unit **30**. At this time, as only a small air flow resistance is offered, the operating handle **8** is not subjected to an increased operation force.

When the driven gear **35** is turned through approximately 120 degrees by the operation of the operating handle **8**, the end **43***a* of the shift pin **43** is contacted by the spindle pin **45** mounted on the side plate **13** so as to shift the shift pin **43** in the right-hand direction viewed in FIG. **4** when the semi-circular grooves **40** and **41** of

the respective clutch wheels **36A** and **37A** are brought into alignment with each other. As a result, the shift piin **43** at its left end as seen in FIG. **4** leaves the semi-circular groove **40** and at its right end enters the semi-circular groove **41** so as to couple the driven gear **35** to the one-way clutch **37**. Simultaneously, the photointerrupter **22** is interrupted by the light-opaque member **19** that turns as a unit with the shaft **11** to detect the operating handle **8** having been pulled by the predetermined amount of angular movement in the direction shown by the arrow X and to output a signal which in turn is transmitted to the motors for the respective reels **2** to **4**. Consequently, the reels **2** to **4** start to rotate simultaneously.

It is to be noted that the shift pin **43** is caused to move quickly by the coil spring **47** so as to hit the side surface of the base plate **12** with its projection **43***b*, producing a shock sound when the shift pin **43** is shifted to the position shown in FIG. **4**. Slot machines which are provided with motor-driven reels are often provided with a sounding device in order to excite the interest of the players. For this purpose, the slot machine embodying the present invention avoids the need for the provision of a separate sounding device.

The clutch wheel **37A** of the one-way clutch **37** rotates only in the clockwise direction about the fixed shaft **33** and is prevented from rotating in the reverse direction. Therefore, after the driven gear **35** has been operationally coupled to the one-way clutch **37** through the shift pin **43**, the driven gear **35** is prevented from rotating in the counterclockwise direction, allowing the operating handle **8** to turn only in the direction to return to the initial position. Consequently, even if the operating handle **8** is stopped in the course of returning to the initial position, the operating handle **8** cannot be again pulled in the direction shown by the arrow X.

The coil spring **27** inside the air cylinder **25** urges the piston rod **26** in a direction wherein the operating handle **8** is urged to move to the initial position. Therefore, if the operating handle **8** is released only after having been fully pulled, the operating handle automatically returns to the initial position. At this time, the air flow into the air cylinder **25** is so controlled as to retard the movement of the operating handle **8**.

Upon clockwise rotation of the driven gear **35**, the driving gear **14** rotates in the counterclockwise direction. When the operating handle **8** fully returns to the initial position, the spindle **46** presses the end **43***b* of the shift pin **43** to the left as viewed in FIG. **4**. Consequently, the fully cylindrical section of the shift pin **43** is disconnected from the semi-circular groove **41** of the clutch wheel **37A** of the one-way clutch **37** and, on the other hand, inserted into the semi-circular groove **40** of the clutch wheel of the one-way clutch **36**. As a result, the driven gear **35** is disconnected from the one-way clutch **37** and operationally coupled to the one-way clutch **36**. At this time, the lug member **17** of the driving gear **14** has ridden over the hook **15** and the retaining means **16** prevents the operating handle **8** from being pulled again. Meanwhile, the photointerrupter **21** is interrupted by the light-opaque member **19** to detect the return of the operating handle to the initial position. Corresponding to this detection of the return of the operating handle **8** to the initial position, a game sequence program for a reel stop operation, a winning combination judgement, and so on are executed in a well-known manner.

In the above-described embodiment, as the shift pin **43** is shifted once every 120-degree turn of the driven gear, it suffices to provide three grooves at equal angular distances on the periphery of each one-way clutch **36, 37**. Nevertheless if six grooves are provided at equal angular distances on the periphery of each one-way clutch, the angle through which the operating handle **8** is operated to start the rotation of the reels can be changed stepwise by increments of **60** degrees merely by changing the location of the spindle pins **45** and **46**.

What is claimed is:

1. An operating handle control device in combination with a slot machine having an operating handle which is swung from its initial position to a starting position for starting a game, the operating control device comprising:

a rotatable wheel supported by a fixed shaft for rotation by said operating handle;

a pair of clutch wheels mounted on said fixed shaft on opposite sides of said rotatable wheel, said clutch wheels being rotatable unidirectionally but oppositely to each other;

longitudinally displaceable interconnecting means for selectively interconnecting said rotatable wheel with one of said pair of clutch wheels; and

actuating means for moving said interconnecting means in opposite directions when said operating handle is swung to said initial position and to said starting position, thereby causing said interconnecting means to perform said selective interconnection.

2. An operating handle control device for a slot machine having an operating handle which is swung from its initial position to a starting position for starting a game, the operating handle control device comprising:

a rotatable wheel supported by a fixed shaft for rotation by said operating handle;

a pair of clutch wheels mounted on said fixed shaft on opposite sides of said rotatable wheel, said clutch wheels being rotatable unidirectionally but oppositely to each other;

interconnecting means for selectively interconnecting said rotatable wheel with one of said pair of clutch wheels, said interconnecting means comprising a pin slidable lengthwise in a bore in said rotatable wheel; and

actuating means for moving said pin in opposite directions when said operating handle is swung to said initial position and to said starting position, thereby causing said pin to perform said selective interconnection.

3. An operating handle control device as defined in claim **2**, and further comprising fixed solid abutment means against which said pin makes a shock sound when moved by said actuating means.

* * * * *